

Pre-Analysis Plan: Randomised impact evaluation of a CBT-based intervention to foster socioemotional skills in vulnerable youth in Brazil

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Abstract

In this experiment, we evaluate an evidence-backed, low-cost intervention to improve academic performance and reduce risk-behaviour through the development of socioemotional skills amongst vulnerable children – those who are most at-risk of being victims and/or perpetrators of violence. We will conduct a Cluster-randomised Trial (CRT) at school level in two municipalities in Brazil to evaluate the SEJA intervention that is based on successful experiences conducted in Chicago, Liberia and Canada. SEJA has low direct costs and is scalable when compared to similar interventions. The program has been designed to leverage municipalities’ existing personnel and infrastructure, making it ideal for implementation in low and medium income countries. We will estimate the interventions’ causal impacts on short and long-term outcomes. On the short-term, we look at outcomes such as socioemotional skills, academic performance, school frequency and enrolment in high school. The longitudinal design of our study allows us to conduct follow-up rounds of survey and administrative data collection to estimate causal impacts on long-term outcomes, such as criminal sanctions, victimisation, other self-reported vulnerabilities, participation in anti-poverty programs and labour market outcomes.

Keywords: Mental health, school performance, crime, cognitive behavioural therapy, socio-emotional education

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1 Introduction

There is growing evidence of a strong association between the development of noncognitive skills in childhood and several favourable outcomes, such as education, earnings in the formal market, and decreased aggressive behaviour including crime (Borghans et al., 2008; Almlund et al., 2011; Duckworth et al., 2012; Vergunst et al., 2019; Algan et al., 2022). However, there is still a lack of evidence about the causal effect of socioemotional skills development on these outcomes and there is little evidence on the effectiveness of programmes focused exclusively on teaching noncognitive skills to school aged populations that can be implemented in developing countries in a way that is part of public schools’ curriculum. In such contexts, schools have only limited resources that can be devoted to the purposeful teaching of socioemotional skills, and yet the challenges faced by students in these environments are often amplified. Specifically, students in developing countries frequently find themselves in environments characterized by higher levels of violence and lower quality of education and educational opportunities. These factors not only hinder the development of noncognitive skills but also exacerbate the difficulties in implementing effective educational programs. The presence of violence, both in and around the school setting, can significantly disrupt the learning process, leading to increased absenteeism and decreased academic performance. Additionally, the scarcity of resources in these educational systems often means that there is a lack of adequately trained teachers and insufficient materials to support the teaching of socioemotional skills. As a result, the integration of noncognitive skill development into the curriculum becomes a complex challenge, one that requires innovative approaches tailored to the unique constraints of these settings. Furthermore, even when considering available evidence collected from similar programmes in rich countries, we still don’t fully understand the mechanisms through which socioemotional skills (potentially) create favourable outcomes.

The current project is an experimental impact evaluation of the SEJA Methodology. SEJA is a teaching programme designed to develop socioemotional skills in students from ages 7 through 15 aimed at promoting better automatic psychological responses in children living in vulnerable areas in Brazil. The SEJA Methodology was developed by a team of Psychologists and Education experts and is inspired by techniques from Cognitive Behavioural Therapy (CBT) and Mindfulness, along with other socioemotional curricula. It is part of a broader set of initiatives implemented by our research partner, the Brazil-based NGO *Instituto Cidade Segura* (ICS). ICS provides technical assistance, creates classroom materials, teacher training and weekly teacher group supervision meeting to improve the quality of childhood education in Brazilian municipalities that do not have the technical expertise and institutional capacity to

develop innovative education programmes without external support.

Existing works have examined the efficacy of programmes designed to foster socioemotional development during childhood, adolescence, and young adulthood. Most such studies have focused on aggression trajectories (Lacourse et al., 2002; Vitaro et al., 1999a,b), and involvement in criminal activities (Blattman et al., 2017; Heller et al., 2017). Instead, our study takes a more agnostic approach. We will use a series of standardised questionnaires that have been validated for Brazil to measure cognitive and noncognitive skills in students from ages 7 through 15. Instead of looking only on the effects of the programme on outcomes related to violence and crime, we examine a series of “self-control” and prosocial skills such as feelings of connection and belonging, emotional regulation, grit, and empathy, as well as school-related outcomes such as grades, attendance, likelihood to graduate, enrolment in high school, and grade repetition. In the medium and long term, we will also use administrative data to track the evolution of both programme participants and control groups on long-term labour market outcomes (employment, formal labour market participation, wage, participation in anti-poverty programmes) as well as available non-income outcomes (victimisation, criminal engagement, and university enrolment).

Furthermore, a small but growing literature examines the impacts of socioemotional training on intermediate outcomes, such as growth mindset and goal setting (Dobronyi et al., 2019; Alan et al., 2019; Yeager et al., 2019), emotional and social competence (Domitrovich et al., 2007; Bierman et al., 2010), prosociality (Kosse et al., 2020), automaticity during high school (Heller et al., 2017) or patience in early adulthood (Blattman et al., 2017). Such works show promising results that boost confidence in the importance of noncognitive skills. Our own experiment takes this literature one step further. First, most of these studies focus on measuring the impact of training programmes on social competences such as grit, pro-sociality, emotional regulation, and personality traits such as grit and empathy, while only assuming that these competences improve learning. While we too seek to examine the effects of the SEJA Methodology on these variables, we will treat them as intermediate goals and examine the extent to which (hypothesised) changes in traits measured through psychometric tests affects learning, crime, and labour market outcomes by employing mediation analysis models (Imai et al., 2011, 2010).

Most studies on the effects of socioemotional programmes on social competences thus far have been all conducted in OECD countries, such as Canada and the United States. However, public education systems in developing countries such as Brazil face several specific challenges. Like in many other Latin American countries, schools in Brazil are often violent environments (Silva and Negreiros, 2020), have limited infrastructure (Vas-

concelos et al., 2021), and their staff have limited access to training, struggle with low salaries and morale, and are subject to little accountability on the quality of their work (OECD, 2019; Elacqua et al., 2022). At home, poorer children often face challenges such as domestic violence and living in territories controlled by criminal organisations (Monteiro and Rocha, 2017; Oliveira, 2021; Cury et al., 2014). These culminates in low levels of educational quality, which translates into low levels of human capital acquisition and perpetuates inequalities over the life circle. The SEJA Methodology was specifically designed to work within such a system. It relies on a comprehensive training that empowers local school staff to deliver the socioemotional development to students without requiring the presence of a psychologist in situ (albeit in its current state, SEJA requires weekly meetings between teachers and psychologists that can happen online). Over the years, ICS created extensive structured materials for school staff on how to deliver lectures and engage in classroom exercises, as well as strategies to deal with students facing especially difficult situations in their family environments. In addition, the NGO has developed student activity materials to follow the programme.

We also hope to examine the effects of the SEJA Methodology in the long-term. By relying on administrative data that is systematically collected by the Brazilian government, we will continue to contrast the evolution of individuals that received the treatment with the development of their counterparts in the control group.

2 Research design

Question: What are the short and long-term impacts of the development of socioemotional skills on children in vulnerable contexts?

Treatment: The SEJA Methodology is inspired in cognitive behavioural techniques, psychoeducation, mindfulness, and empathy fostering to encourage changes in the lives of children and young people who are enrolled in the city’s public schools. In the classrooms, the programme will be implemented during class hours and as part of the normal school curriculum by teachers who already work for the municipal government and will receive training and supervision from ICS staff. They will have a weekly group supervision meeting with ICS psychology experts and teach one SEJA class per week and class group for half of the school year, for a total of 20 sessions per class group.

Evaluation design: The current evaluation will be implemented as a two-level cluster-randomised trial (CRT), where the second level is the school and the first level is the student (Malmberg-Heimonen and Tøge, 2017). We will be conducting an experimental evaluation of the SEJA programme. It is a 20-week programme, with one session of 1 hour per week, for a total of 20 hours of classes to be attended. The

SEJA programme, designed by the Instituto Cidade Segura (ICS), aims to develop the socioemotional skills of children between the ages of 7 and 15, with a view to improving psychological responses in the most vulnerable regions of Brazil. Its curriculum is based on the development of self-awareness, self-management, social awareness, relational competence and responsible decision-making, and its implementation will be randomised among schools within the municipal network of the two municipalities of the study. The experiment will involve a total of 96 schools, with 47 being treated and 49 serving as controls. The total number of students will be 44,407, with 21,088 in the treatment group and 23,320 in the control group. We will randomly select around 30 students from each school to participate in data collection. Nevertheless, administrative data will reflect the total number of students per municipality.

Measurement: In order to measure SEJA’s effect on the short-term outcomes, we will conduct primary data collection with a random sample of treatment and control students, measured using psychometric instruments and administrative data to measure school performance. For the long-term impacts, we will use administrative datasets from Federal, state, and local governments which can be linked using individual social security numbers.

Short-term: Psychometric instruments that measure Impulsiveness and aggression, mental health, empathy, presence of socioemotional skills, values, attention control, and self-esteem. Administrative data to measure school grades, school attendance, and other educational outcomes.

Long-term: criminal sanctions, victimisation, self-reported vulnerabilities, participation in anti-poverty programmes, and labour market outcomes (all coming from administrative data).

Target population: All public schools managed by the municipalities in both cities will be included in the randomization list. The target population for SEJA are children between 1st and 9th grade enrolled in municipal schools. All municipal schools in Brazil are free to attend, have free meal programmes, and provide instructional materials to students. School attendance is mandatory.

Implementing partner(s): The Instituto Cidade Segura (ICS) is our leading implementing partner. The NGO is known for carrying out school programs on the development of mindfulness and socioemotional skills. These programs have already been implemented in other Brazilian municipalities. Their psychologists and education experts have developed the SEJA curriculum and have already established partnerships with the cities where the experiment will be conducted, namely Pelotas and Canoas. In these municipalities, ICS has supported the implementation process of “Every Youth Counts,” a programme that promotes local, periodic meetings between different munic-

ipal agencies to identify children and teenagers living in context of vulnerability. ICS has other initiatives partnering up with municipalities to implement crime prevention policies.

Ethics: This project, its consenting documentation, and the instruments to be used in the policy evaluation have already been approved by the Ethics Compliance Committee in Research Involving Human Beings at Fundação Getulio Vargas (CEPH/FGV). The research involves minimal risk to the health of the participants, not greater than the risk of an appointment with a psychologist or social worker. Also, some questions may make participants uncomfortable. To mitigate such risks, the participant can opt not to answer any question that they wish and/or interrupt any activity carried out in the survey at any time.

The electronic database will be anonymised and stored in a secure virtual environment, under the responsibility of the researchers. More importantly, no individual data will be shared with researchers who are not linked to the project or outside the secure channels established in the ethics protocol.

3 Experimental Design

We propose an experimental impact evaluation of the SEJA Methodology through a two-level cluster-randomised trial (CRT), where the second level is the school, and first level is the student (Malmberg-Heimonen and Tøge, 2017). By randomising schools into treatment and control groups and following the students over time, this project will examine short and long-term results on a number of outcomes. On the short-term, we look at outcomes such as socioemotional skills, academic performance, school frequency, and enrolment in high school. We will also look at long-term outcomes such as victimisation, labour market participation, wage in the formal market, participation in anti-poverty programs, and criminal engagement. A full list of outcomes of interest and our measurement instrument for each of them is available in Table 1, below.

Our randomisation of treatment allocation is justifiable due to financial restrictions. Since in the municipalities there is an excess of demand for the program, we will randomly assign schools into treatment while ensuring that we are treating the maximum number of schools our budget allows. A lottery will assign schools into treatment and control groups, which will create comparable groups of students over time. We proceed with a random experiment design with cluster and strata as we show in Figure 1 (Imbens and Rubin, 2015).

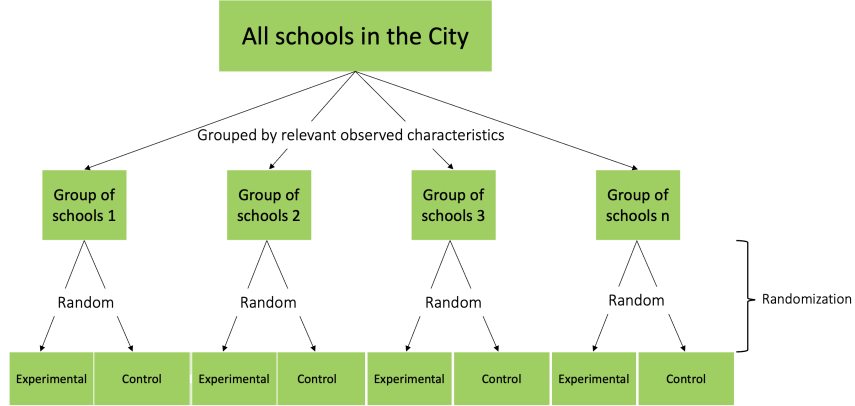


Figure 1: Diagram of the proposed Randomisation strategy.

4 Data and Outcomes

Instructional material and data collection are of utmost importance for this project. The large-scale data collection effort will result in a comprehensive dataset spanning at least two time periods each. The richness of variables to which we will have access will allow us to explore several dimensions of interest and the mechanisms through which they are affected, conducting mediation analyses. Furthermore, the large number of clusters and observations will ensure that we have statistical power to estimate causal impacts accurately.

We will carry out primary data collection of measures of child socioemotional abilities indicators. The outcomes of interest will be as follows:

1. Impulsiveness and aggression of students using instruments validated in the literature to assess the behavioural construct of impulsiveness (Barratt Scale/BIS-11, [Patton et al. \(1995\)](#); [Malloy-Diniz et al. \(2010\)](#))
2. Mental health of teachers using instruments validated in the literature to assess emotional problems, hyperactivity, relationship, conduct, and pro-social behaviour (SDQ Adult; [Goodman et al. \(1998\)](#)).
3. Mental health of students using instruments validated in the literature to assess emotional problems, hyperactivity, relationship, conduct, and pro-social behaviour (SDQ Youth; [Goodman \(1997\)](#); [Stivanin et al. \(2008\)](#)).
4. Empathy of students using instruments validated in the literature to assess empathy and its several dimensions (IRI/EMRI, [Davis \(1983\)](#); [Koller et al. \(2001\)](#)).

5. Grit of students ([Duckworth et al. \(2007\)](#); [Noronha and Almeida \(2022\)](#)).
6. Self-efficacy of students using instruments validated in the literature to assess their beliefs in his or her capacity to learn, relating indicators of production and learning-oriented behaviour (Self-Efficacy Assessment Form, [Cristina Medeiros et al. \(2000\)](#)).
7. Values (Schwartz scale).
8. School Engagement of teachers using instruments validated in the literature to assess their engagement with school activities (Scale of School Engagement, [Finn et al. \(1995\)](#); [Silveira and Justi \(2018\)](#)).
9. Attention control (Attentional Control Scale, [Filgueiras et al. 2015](#)).
10. Self-esteem (Rosenberg Self Esteem Scale, [Pimentel et al. \(2018\)](#)).
11. School Engagement of students using instruments validated in the literature to assess their engagement with school activities (Scale of School Engagement).
12. School Violence (administrative data from Brazilian Ministry of Education – "Prova Brasil").
13. Educational outcomes on students in primary education: school Performance, educational attainment, probability of enrolling in high school (administrative data from Brazilian Ministry of Education – "Prova Brasil" and "Censo Escolar").
14. Long-term involvement in crime: incarceration (administrative data from Brazilian Ministry of Justice).
15. Long-term impacts on health and violence: violent death (administrative data from Brazilian Ministry of Health – "DataSUS Database").
16. Long-term impacts on participation in anti-poverty programs (administrative data from Brazilian Ministry of Social Assistance – "Cadastro Único Database").
17. Long-term impacts on the labor market: formal employment, wages, use of unemployment benefits (administrative data from Brazilian Ministry of Labor – "RAIS Database").

| Outcome | Type | Measurement | Reference |
|---|------|----------------------------------|---|
| Impulsiveness and aggression | I | Barratt Scale/BIS-11 | Patton et al. 1995; Malloy-Diniz et al. 2010 |
| Mental health of teachers | I | SDQ Adult | Davies 1983; Koller et al. 2001 |
| Mental health of students | I | SDQ Youth | Goodman 1997; Stivanin et al. 2008 |
| Empathy | I, F | IRI/EMRI | Goodman et al. 1998 |
| Values | F | Portraits Questionnaire Schwartz | Pasquali, 2004 |
| Grit | I | Grit Oviedo | Duckworth et al. 2007; Noronha and Almeida 2022 |
| Self-efficacy | I | Self-Efficacy Assessment Form | Medeiros et al. 2000 |
| School Engagement of teachers | I | Scale of School Engagement | Finn et al. 1995; Silveira and Justi 2018 |
| School Engagement of students | I | Scale of School Engagement | Finn et al. 1995; Silveira and Justi 2018 |
| School Violence | F | Admin data | INEP / Censo Escolar |
| School Performance | F | Admin data | INEP / Prova Brasil |
| Educational attainment | F | Admin data | SME / INEP |
| Probability of enrolling in high school | F | Admin data | INEP / SEE |
| Long term involvement in crime (incarceration) | F | Admin data | SSP/SEAP RS |
| Long term impacts on health and violence (violent death) | F | Admin data | DataSUS Database |
| Long term impacts on participation in anti-poverty programmes | F | Admin data | CadÚnico |
| Long term impacts on the labor market: formal employment | F | Admin data | RAIS Database |
| Long term impacts on the labor market: wages | F | Admin data | RAIS Database |
| Long term impacts on the labor market: use of unemployment benefits | F | Admin data | RAIS Database |
| Self-Esteem | I, F | Rosenberg Self Esteem Scale | Pimentel et al. 2018 |
| Attention control | I | Attentional Control Scale | Filgueiras et al. 2015 |

Table 1: List of outcomes to be measured in the SEJA experiment.

5 Implementation and Power Calculations

The pilot program will be implemented in two municipalities in Rio Grande do Sul, Brazil. Our sample will include a total of 96 municipal schools, with half of them randomly assigned to receive the treatment. This will result in a sample size comprising approximately 44,407 students across all schools in both cities. To carry out our primary data collection, we will draw a random subsample of approximately 2,550 subjects. This subsample will consist of 30 students selected from each school. Our study will involve a sample of schools, with 21 treated schools out of a total of 43 schools in Canoas and 26 treated schools out of 53 total schools in Pelotas. Canoas is home to approximately 350,000 residents, while Pelotas has a population of around 343,000. It's important to note that Canoas has a notably high homicide rate of 32 per 100,000 inhabitants, making it one of the most dangerous cities in Brazil. On the other hand, Pelotas has a slightly lower homicide rate of 24 per 100,000 inhabitants, but this is still higher than the national average in 2019, which stood at 21 per 100,000 inhabitants according to (SIMdatasus, 2023).

We have calculated an intra-cluster correlation coefficient (ICC) ¹ of 0.11 based on Prova Brasil data, a standardised exam, which is one of our secondary indicators and a crucial tool for educational diagnosis in Brazil. This ICC value was used to determine the sample size required for the primary data collection. With 80% statistical power, proportion of treated of 50% , and a significance level of $\alpha = 0.05$, we have determined that a sample size of 30 students per cluster will allow us to detect a minimal effect of 0.216 standard deviations for the personality traits outcomes.

| MDE | n per cluster | cluster | ICC |
|-------|---------------|---------|------|
| 0.165 | 30 | 96 | 0.05 |
| 0.216 | 30 | 96 | 0.11 |
| 0.275 | 30 | 96 | 0.2 |

Table 2: Power Calculations

5.0.1 Two-level cluster-randomized trial (CRT)

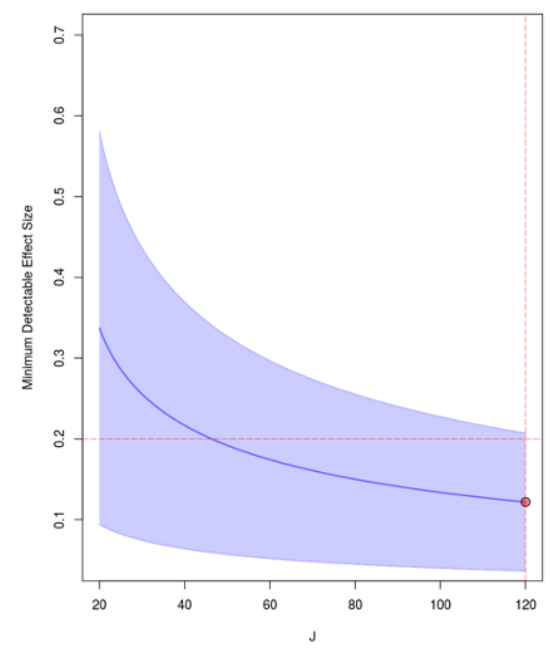


Figure 2: ICC = 0.05

| Number of Schools | MDE |
|-------------------|-------|
| 142 | 0.128 |

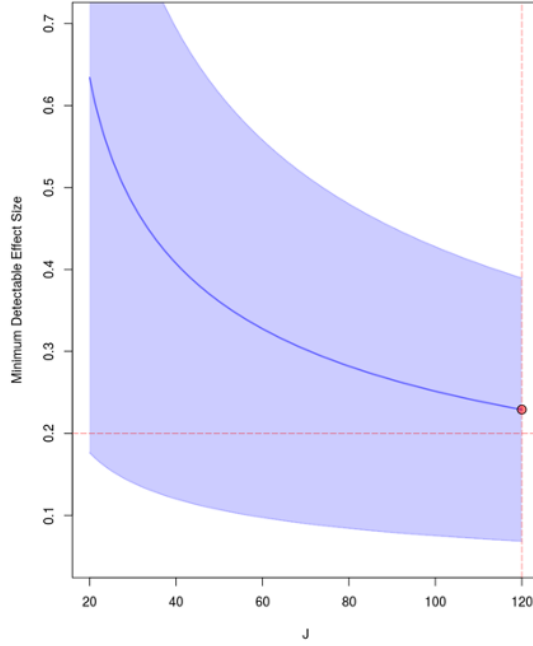


Figure 3: ICC 2 =0.20

| Number of Schools | MDE |
|-------------------|-------|
| 142 | 0.214 |

6 Empirical Approach

The effects of SEJA on the outcomes of interest will be estimated using a regression as follows:

$$y_{ijts} = \alpha + \tau W_{js} + \gamma T_{tjs} + \delta W_{js} \times T_{tjs} + \theta' X_{ijts} + \mu_s + \varepsilon_{ijts} \quad (1)$$

Where y_{ijts} is the result of interest of the individual i in school j and strata s (municipality); W_{js} is an indicator variable that assumes a value equal to one if the school was drawn to be a beneficiary of SEJA (and zero otherwise); X_{ijts} is a vector of observed variables of the students at the baseline (that may include socioeconomic indicators and initial child outcomes); μ_s is the fixed-effect of strata s ; and ε_{ijts} is a random error term. The standard errors are adjusted for heteroskedasticity and clustering at the school level using White standard errors. The coefficient of interest is δ . It captures the average treatment effect of the program in case of full compliance.

We will also investigate potential mediators, following the method developed by Imai et al. (2011, 2010), which consists in implementing a two steps algorithm. First, it

fits regression models for the mediator and the outcome and generates predictions for the mediator into two different scenarios: one under the treatment and one under the control. Second, the algorithm uses the outcome model to predict the potential outcome. The mediator and the outcome models are represented by equations as follows:

$$M_i(T_i) = \alpha_1 + \beta_1 T_i + X_i' \eta_1 + \varepsilon_{1i} \quad (2)$$

$$Y_i(T_i, M_i) = \alpha_2 + \beta_2 T_i + \gamma M_i + X_i' \eta_2 + \varepsilon_{2i} \quad (3)$$

Where M_i is the mediator of interest, T_i is a dummy treatment indicator, Y_i is the result of interest. In both equations, X_i' is the set of observed pre-treatment covariates.

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